

WHAT IS CLAIMED IS:

1 1. A method for enhancing venous return to the heart, the method
2 comprising:

3 delivering a positive pressure breath to a person suffering from low blood
4 pressure or head trauma;

5 actively extracting respiratory gases from the person's airway following the
6 positive pressure breath to create an intrathoracic vacuum to enhance venous return to the
7 heart; and

8 repeating the steps of delivering positive pressure breaths and extracting
9 respiratory gases.

1 2. A method as in claim 1, further comprising interfacing an impedance
2 threshold valve to the person's airway, wherein the threshold valve prevents airflow to the
3 person's lungs when attempting to inspire until the threshold valve opens, thereby augmenting
4 blood flow back to the heart.

1 3. A method as in claim 2, wherein the threshold valve is configured to
2 open when the negative intrathoracic pressure exceeds about -7 cmH₂O.

1 4. A method as in claim 1, further comprising interfacing a flow limiting
2 valve to the patient's airway and regulating the pressure or the volume of the positive pressure
3 breath with the flow limiting valve.

1 5. A method as in claim 1, further comprising interfacing a pressure
2 source and a vacuum source to the person to deliver the positive pressure breath and to
3 extract the respiratory gases.

1 6. A method as in claim 5, wherein the pressure source and the vacuum
2 source comprise a compressible bag system.

1 7. A method as in claim 6, further comprising reconfiguring the
2 compressible bag system to operate only as a pressure source.

1 8. A method as in claim 1, further comprising exhausting the extracted
2 respiratory gases to the atmosphere.

1 9. A method as in claim 1, further comprising varying the duration of the
2 positive pressure breaths or the extraction of the respiratory gases over time.

1 10. A method as in claim 1, further comprising supplying supplemental
2 oxygen to the person.

1 11. A method as in claim 1, further comprising monitoring at least one
2 physiological parameter of the person and varying the positive pressure breath or the
3 extraction of respiratory gases based on the monitored parameter.

1 12. A method as in claim 11, wherein the physiological parameters are
2 selected from a group consisting of end tidal CO₂, oxygen saturation, blood pressure and
3 cardiac output.

1 13. A method as in claim 11, further comprising varying the amplitude of
2 the positive pressure breath or the extraction of respiratory gases.

1 14. A method as in claim 6, wherein the respiratory gases are extracted
2 upon recoiling of the compressible bag system.

1 15. A method as in claim 1, wherein the intrathoracic vacuum lowers the
2 person's intrathoracic pressure to about -1mm Hg to about -20mm Hg, and wherein the
3 intrathoracic vacuum is in the range from about -2mm Hg to about -60mm Hg.

1 16. A method as in claim 1, further comprising measuring the volume of
2 the positive pressure breath.

1 17. A method as in claim 11, further comprising transmitting information
2 on the measured parameter to a remote receiver.

1 18. A method for treating a person suffering from cardiac arrest, the
2 method comprising:
3 repeatedly compressing the person's chest;
4 preventing or impeding respiratory gases from flowing to the person's lungs
5 for at least some time between chest compressions;
6 periodically delivering a positive pressure breath to the person;

7 extracting respiratory gases from the person's airway following the positive
8 pressure breath to create an intrathoracic vacuum to enhance venous return to the heart.

1 20. A device for manipulating intrathoracic pressures, comprising:

2 a compressible bag structure;

3 an interface member coupled to the bag structure that is configured to interface

4 with a person's airway;

5 a one way forward valve coupled to the bag structure to permit respiratory

6 gases to flow to the person's airway upon compression of the bag structure;

7 a one way exit valve coupled to the bag structure to permit respiratory gases to

8 be pulled from the person's airway upon decompression of the bag structure, thereby

9 producing a negative intrathoracic pressure.

1 21. A device as in claim 20, wherein the forward valve and the exit valve
2 are selected from a group of valves consisting of a spring loaded check valve, a fish mouth
3 valve, a ball valve, a disc valve, a baffle, a magnetic valve, and an electronic valve.

1 22. A device as in claim 20, wherein the bag structure is configured to
2 produce a vacuum in the range from about -2mm Hg to about -60mm Hg to produce a
3 negative intrathoracic pressure in the range from about -1mm Hg to about -20mm Hg.

1 23. A device as in claim 20, further comprising an impedance threshold
2 valve coupled to the compressible bag structure, wherein the threshold valve is configured to
3 permit respiratory gases to flow to the person's lungs once a certain negative intrathoracic
4 pressure is exceeded.

1 24. A device as in claim 20, further comprising a flow limiting valve
2 coupled to the compressible bag to regulate the flow of respiratory gases to the patient's lungs
3 upon compression of the bag structure.

1 25. A device as in claim 20, further comprising a switch for permanently
2 closing the exit valve.

1 26. A device as in claim 20, further comprising an exhaust valve coupled
2 to the bag structure to permit respiratory gases pulled from the person's airway to be
3 exhausted to the atmosphere.

1 27. A device as in claim 20, further comprising an oxygen source to
2 provide supplemental oxygen to the person through the interface member.

1 28. A device as in claim 20, further comprising at least one physiological
2 sensor operably coupled to the compressible bag structure to measure at least one
3 physiological parameter of the person.

1 29. A device as in claim 28, wherein the physiological sensor is selected
2 from a group consisting of end tidal CO₂ sensors, oxygen saturation sensors, blood pressure
3 sensors and cardiac output sensors.

1 30. A device as in claim 28, further comprising a transmitter coupled to the
2 sensor to transmit information on the measured parameter to a remote receiver.

1 31. A device as in claim 20, further comprising a regulation valve coupled
2 to the bag structure to regulate the rate of flow of respiratory gases to the person's airway and
3 the pressure of the respiratory gases delivered to the person's airway.

1 32. A device as in claim 20, wherein the bag structure comprises a
2 ventilation chamber that supplies respiratory gases through the forward valve upon
3 compression of the bag structure and an expiration chamber that receives respiratory gases
4 from the person through the exit valve upon decompression of the bag structure.

1 33. A device as in claim 20, wherein the bag structure further comprises a
2 venturi system that pulls respiratory gases from the person's lungs upon decompression of the
3 bag structure.

1 34. A device as in claim 20, wherein the bag structure is constructed of an
2 elastomeric material.

1 35. A method for treating a person suffering from low blood pressure, the
2 method comprising:

